INVITED COMMENTARY

Craniopuncture for Spontaneous Intracerebral Hemorrhage: Ahead of its Time or Behind the Times?

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In this article, Wanbing et al. performed a single-center, retrospective cohort study to identify predictors of postoperative CSF outflow following craniopuncture for spontaneous intracerebral hemorrhage (ICH) with intraventricular hemorrhage (IVH) [13]. The study cohort comprised 125 patients who underwent 189 craniopuncture procedures, and CSF outflow was achieved in 40% of craniopunctures. Based on their analysis, the authors found that a mean hematoma radiodensity ≤ 59 Hounsfield units (HU) on computed tomography (CT), intrahematoma placement of the craniopuncture needle tip approximately 22–34 mm from the ventricular tear, and mean hematoma CT radiodensity ≤ 60 HU within 34 mm of the ventricular tear were predictors of CSF outflow after craniopuncture for ICH with IVH. The strength of this work lies in its detailed analysis of the neuroimaging and technical aspects of the craniopuncture procedure. Due to the paucity of publications pertaining hematoma evacuation with craniopuncture, the authors have provided a relevant contribution to the ICH literature.

The limitations of this study are noteworthy. The biggest weakness of the study is the absence of clinical outcomes data. While the radiographic outcomes appear acceptable, the more important question of how the patients fared is unanswered. The primary outcome measure of postoperative CSF outflow is ambiguous, and it is not generalizable to other ICH surgery studies. The authors should instead have emphasized the degree

of hematoma evacuation and final hematoma volume, so as to facilitate comparisons with other ICH evacuation series using similar or different surgical approaches. Since this was a single-arm study in which all patients were treated with craniopuncture, direct comparisons to those who underwent medical management or non-craniopuncture ICH evacuation during the study period could not be made. Finally, the authors did not provide data regarding the presence and evolution of perihematoma edema, which has become increasingly used as a radiographic marker of secondary brain injury in ICH patients [4, 5].

Although definitive evidence supporting surgical intervention for ICH is lacking, studies continue to be conducted to optimize patient selection and treatment approaches for ICH evacuation [1]. To date, randomized controlled trials (RCT) of craniotomy for ICH evacuation have failed to show a benefit from intervention [7, 8]. As such, there is a trend in the field of ICH management toward minimally invasive surgery (MIS) for hematoma evacuation, since it affords the potential benefits of reduced systemic physiological strain and normal brain tissue disruption compared to conventional craniotomy [11]. MIS approaches for ICH include the catheter-based minimally invasive surgery with thrombolysis in ICH evacuation (MISTIE) technique, endoscopy, endoport, and craniopuncture [6, 9, 10]. The MISTIE technique failed to improve outcomes in a phase III trial of adult patients with supratentorial ICH > 30 mL in volume [3]. The safety and efficacy of endoscopic and endoport-assisted ICH evacuation are currently being evaluated in ongoing multicenter RCTs.

Craniopuncture is predominantly performed in China, and Chinese authors have provided nearly the totality of the published literature on this MIS ICH evacuation technique. Compared to the MISTIE technique, in which

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the catheter is placed in the operating room using stereotactic neuronavigation, craniopuncture is performed at the bedside without neuronavigation. Whereas catheters in the MISTIE technique target the long axis of the hematoma, in patients with IVH, craniopuncture needles target the ventricular tear in order to promote CSF outflow from the ventricle into the hematoma cavity [14]. A RCT of craniopuncture versus medical management for small basal ganglia ICHs (volume 25–40 mL) found greater improvement in neurological function at 14 days, better performance of activities of daily living (ADL) at three months, and a higher likelihood of functional independence at three months after craniopuncture, although the 3-month mortality rates were similar between the two cohorts [15]. Another RCT of craniopuncture with urokinase infusion versus miniature craniotomy for basal ganglia ICH (volume 30–80 mL) reported a higher proportion of favorable outcome (Barthel index ≥ 95) at 90 days, lower 90-day mortality rate, and reduced rebleeding rate (9% vs. 21%) in the craniopuncture cohort, although the degree of neurological impairment at 14 days and ADL performance at 90 days were similar between the two treatments [12]. A more recent comparison of craniopuncture versus craniotomy for basal ganglia ICH (volume 30–60 mL) with or without the CT angiography spot sign showed better outcomes after craniotomy for spot sign positive patients but similar outcomes between the two interventions for spot sign negative patients [2].

The integration of craniopuncture into contemporary practice in the United States, where stereotactic neuronavigation is readily available in most hospitals with neurosurgical capabilities, is unlikely. Furthermore, practicing neurosurgeons untrained in craniopuncture may be reluctant to adopt this technique, since the number of cases necessary to overcome its learning curve is unknown. Conversely, craniopuncture is also unlikely to be abandoned by neurosurgeons in China, so we anticipate future studies that will continue to shape the role of this intervention in ICH management. Craniopuncture may prove to be useful, perhaps as a temporizing measure for appropriately selected cases, in developing countries or rural communities without immediate access to modern intraoperative image guidance technologies.

Conflict of interest

Dr. Ding has nothing to disclose.

Ethical Approval/Informed Consent

Not applicable.

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